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NEW KNEE-TYPE MILLING MACHINES IN THE SOVIET UNION

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Models 6N82, 6N82G, 6N12, 6N83, 6N83G, 6N13

These machine tools were designed by chief designer Vragov, head designer Petyashin, head technologists Khitrun and Varavin, and designers Komarov, Olenichev, Vinogradov, Tikhomirov, Vashchuk, Gushchin, Yezhevskiy, Kasperovich, and Derbenev.

The No 2 knee-type milling machines have a 1,250 x 320-millimeter table and the No 3 models have a 1,600 x 400-millimeter table. These machines consist of the following types:

	No 2 Models	No 3 Models
Universal	6N82	6N83
Horizontal	6N82G	6N83G
Vertical	6N12	6N13

Both of these groups have absolutely analogous kinematic systems which make possible the construction of six types of machine tools with identical design components and basic mechanisms. For this reason, only two models will be described here, the 6N82 universal and the 6N12 vertical.

The column of the 6N82 machine is a rigid casting with dovetail-shaped ways on which the knee moves vertically. The electrical apparatus is recessed on the two bottom sides of the column.

The speed-change mechanism is located over the recess on the left side of the column. Any speed can be set by the turn of a dial without any other intermediary steps. Speed is changed by means of a single hand lever located under the dial.

The speed-change box located inside the column can transmit 18 different speeds to the spindle, ranging from 30 to 1,500 revolutions per minute.

The 5.8-kilowatt electric motor for the speed-box drive is of the flanged type, having a speed of 1,450 revolutions per minute. It is all-enclosed on the rear of the column. The top of the column has dovetail ways for carrying the arbor support.

The knee is box shaped and has vertical dovetail ways and horizontal square ways.

The feed box, located to the left of the column transmits 18 different work feeds to the lead screw, ranging from 19 to 950 millimeters per minute.

The 2.2-kilowatt electric motor for the feed box drive is located inside the knee. Feed is changed by a single hand lever.

The saddle travels transversely on the square knee ways and the work table moves in a longitudinal direction on the saddle. The longitudinal movement of the table has two controls: at the front and on the left side of the machine. At the front, the table has a T-slot with stops for reversing the table.

The column is bolted to the base on which the vertical feed screw for elevating the knee and the coolant pump are secured. The base hollow serves as a tank for the coolant.

The Model 6N12 vertical milling machine differs from the horizontal only in that its column and frame in which the spindle is mounted are cast as a whole. The speed box is located in the upper part of the column and transmits 18 different speeds to the spindle, ranging from 30 to 1,500 revolutions per minute.

The Model N83 [sic -- 6N83?] is provided with two additional supports to prevent the exceptionally long knee from sagging.

The Model 6N13 has an adjustable head which is moved vertically by means of a hand wheel.

All of the machines have duplicate push button and lever controls at the front and at the left side. Since the machines are automatic, it is possible to work on closed pendulum and intermittent cycles which permit increased productivity and the application of principles of multimachine-tool servicing. Their design makes possible conveyer production and maximum standardization.

The inventors of these machines, B. N. Muravin, V. A. Anufriyev, N. M. Khitrun, and B. I. Petyashin, were awarded Stalin Prizes in 1950.

Conclusions

1. The new models of knee-type milling machines meet all requirements for high productivity by their high-speed characteristics, power capacity, and rigidity.

Series production of these machines will serve as an important factor for further introduction of high-speed milling of metals.

2. The designs of these machines offer exceptional possibilities for their manufacture by conveyer methods.

3. In all the milling machines described in this and the two previous articles, the mechanisms for one or another purpose such as for changing the rate of feed, eliminating play in the lead-screw nut, securing the table in universal models, and the shape of the knee ways differ. It would be expedient to carefully verify the indicated characteristics of these mechanisms under standard production conditions in order to standardize them in accordance with what proves to be the most reliable and technological design.

4. In some cases the installed power in these machines may not be adequate to the heaviest cutting regime of which the machine is capable. This should be checked in practice and the power increased where necessary.

5. As to size of table, Models 6P80 and 6N81 differ slightly (50 millimeters in width and 150 millimeters in length). It would be expedient to put only the larger one of these into series production.

6. The weight of these machine tools should be decreased 8-10 percent by reducing the thickness of the cast walls which comprise 60-65 percent of the total weight. Up to the present, designers have specified the wall thickness for beds, columns, frames, tables, and similar parts as 20-25 millimeters and thicker, as a safeguard against casting defects. In most cases a wall thickness of not more than 15 millimeters is adequate.

Workers in molding plants of the Ministry of Machine-Tool Building must perfect as quickly as possible the production of thin-walled castings and in this way save metal by reducing the weight of cast parts. Covers, doors, and similar parts should be formed from thin, soft, sheet steel instead of cast iron.

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